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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)



10/534745

Applicant's or agent's file reference R-8804-4PCT2	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/ES 03/00584	International filing date (day/month/year) 18.11.2003	Priority date (day/month/year) 19.11.2002
International Patent Classification (IPC) or both national classification and IPC G02F1/21		
Applicant BAOLAB MICROSYSTEMS S.L. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
 - ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:
 - I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☐ Lack of unity of invention
 - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain documents cited
 - VII ☐ Certain defects in the international application
 - VIII ☐ Certain observations on the international application

Date of submission of the demand 18.06.2004	Date of completion of this report 08.04.2005
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Denise, C Telephone No. +49 89 2399-2452 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/ES 03/00584**

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-25 received on 22.06.2004 with letter of 18.06.2004

Claims, Numbers

1-27 filed with telefax on 15.02.2005

Drawings, Sheets

1/15-15/15 received on 22.06.2004 with letter of 18.06.2004

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY
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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-27
	No: Claims	
Inventive step (IS)	Yes: Claims	1-27
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-27
	No: Claims	

2. Citations and explanations

see separate sheet

SECTION V

1 Reference is made to the following documents;

D1 = WO 01 06543 A
D2 = US-B1-6 428 173
D3 = US-B-6 229 640

2 Reasoned statement with regard to novelty (Article 33 (2) PCT) and inventive step (Article 33 (3) PCT)

2.1 Claim 1

2.1.1 Novelty

Document D1, which is considered to represent the most relevant state of the art, discloses a miniaturized electro-optical device from which the subject-matter of claim 1 differs in that the first and the second condenser plates are facing each other (in D1, the first and second condenser plate lie on the same plane (see Fig.14A, (440) and (440)) and are therefore not facing each other). In addition, in the device defined in claim 1, a conductive element is movable from a first zone where the first condenser is located to a second zone where the second condenser is located. In the device disclosed in D1, a conductive element is only movable in a direction orthogonal to the plane in which the condenser plates are located (see Fig.14A, (106)) and not movable from one condenser plate to the other condenser plate.

The subject-matter of claim 1 is therefore new with respect to the device disclosed in D1.

Document D2 discloses a movable microelectromechanical mirror from which the subject-matter of claim 1 differs in that it comprises two condenser plates facing each other and a conductive element movable from one condenser plate

to the other condenser plate.

The subject-matter of claim 1 is therefore new with respect to the device disclosed in D2.

Document D3 discloses a microelectromechanical optical switch from which the subject-matter of claim 1 differs in that it comprises two condenser plates facing each other and a conductive element movable from one condenser plate to the other condenser plate.

The subject-matter of claim 1 is therefore new with respect to the device disclosed in D3.

2.1.2 Inventive step

None of the documents D1, D2 and D3 discloses or suggests the use of two condenser plates facing each other and a conductive element movable from one condenser plate to the other condenser plate.

Therefore, the subject matter of claim 1 involves an inventive step.

2.2 Claims 2-16

Claims 2-16 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

2.3 Claims 17-27

Claims 17-27 concern specific uses of the device defined in claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

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CLAIMS

1.- A miniaturised electro-optical device characterised in that it comprises:

- 5 - a first zone facing a second zone,
- a first condenser plate (3) arranged in said first zone,
- a second condenser plate (9) arranged in said second zone and facing said first condenser plate (3), in which said second plate (9) is smaller than or equal to said first condenser plate (3),
- 10 - an intermediate space (25) arranged between said first zone and said second zone,
- a conductive element (7) arranged in said intermediate space (25), said conductive element (7) being mechanically independent from said first zone and second zone and being suitable for effecting a movement across
- 15 said intermediate space (25) from said first zone to said second zone and vice versa, depending on voltages present in said first and second condenser plates (3, 9),
- a first inlet/outlet point (15) of light from an optical circuit, a second inlet/outlet point (17) of said optical circuit, arranged in such a way as to
- 20 allow the passage of light therebetween,
- at least one first stop (13), where said conductive element (17) is suitable for establishing contact with said first stop (3) and where said conductive element (7) modifies the state of passage of light between said
- first inlet/outlet point (15) and said second inlet/outlet point (17) when it is in
- 25 contact with said first stop (13).

2.- The electro-optical device of claim 1, characterised in that said first stop (13) is arranged between said second zone and said conductive element.

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3.- The electro-optical device of one of claims 1 or 2, characterised in that it comprises, additionally, a third condenser plate (11) arranged in said second zone, where said third condenser plate (11) is smaller than or

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equal to said first condenser plate (3), and where said second and third condenser plates (9, 11) are, together, larger than said first condenser plate (3).

- 5 4.- The electro-optical device of any of claims 1 to 3, characterised in that it comprises, additionally, a third condenser plate (11) arranged in said second zone and a fourth condenser plate (5) arranged in said first zone, where said first condenser plate (3) and said second condenser plate (9) are equal to each other, and said third condenser plate (11) and said
10 fourth condenser plate (5) are equal to each other.

5.- The electro-optical device of claim 4, characterised in that said first, second, third and fourth condenser plates are all equal to each other.

- 15 6.- The electro-optical device of claim 4 or claim 5, characterised in that it comprises, additionally, a fifth condenser plate (35) arranged in said first zone and a sixth condenser plate (37) arranged in said second zone, where said fifth condenser plate (35) and said sixth condenser plate (37) are equal to each other.

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7.- The electro-optical device of any of claims 1 to 6, characterised in that it comprises a second stop between said first zone and said conductive element (7).

- 25 8.- The electro-optical device of claim 7, characterised in that it comprises a third inlet/outlet point (21) and a fourth inlet/outlet point (23) arranged between said first zone and said conductive element (7) such that said conductive element (7) modifies the state of passage of light from a second optical circuit when in contact with said second stop.

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9.- The electro-optical device of any of claims 1 to 8, characterised in that each of the assemblies of said condenser plates arranged in each of said first zone and second zone has a central symmetry relative to a centre

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of symmetry, where said centre of symmetry is superimposed on the centre of masses of said conductive element (7).

5 10.- The electro-optical device of any of claims 1 to 9, characterised in that the assembly of said condenser plates arranged in each of said first zone and second zone has central asymmetry, thereby generating a moment of forces relative to the centre of masses of said conductive element (7).

10 11.- The electro-optical device of any of claims 1 to 10, characterised in that said conductive element (7) has rounded external surfaces.

15 12.- The electro-optical device of claim 11, characterised in that said conductive element (7) is cylindrical.

13.- The electro-optical device of claim 11, characterised in that said conductive element (7) is spherical.

20 14.- The electro-optical device of any of claims 1 to 13, characterised in that said conductive element (7) has an upper face and a lower face, said upper and lower faces being perpendicular to said movement of said conductive element (7), and at least one side face, where said side face has slight protuberances.

25 15.- The electro-optical device of any of claims 1 to 14, characterised in that said conductive element (7) is hollow.

30 16.- The electro-optical device of claim 1, characterised in that said first condenser plate (3) has a surface area which is equal to or double the surface area of said second condenser plate (9).

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17.- Use of an electro-optical device according to any of claims 1 to 16, as an accelerometer.

18.- Use of an electro-optical device according to any of claims 1 to 16, as a tiltmeter.

19.- Use of an electro-optical device according to any of claims 1 to 16, as a detector of Coriolis forces.

20.- Use of an electro-optical device according to any of claims 1 to 16, as a pressure sensor.

21.- Use of an electro-optical device according to any of claims 1 to 16, as a microphone.

22.- Use of an electro-optical device according to any of claims 1 to 16, as a flowrate sensor.

23.- Use of an electro-optical device according to any of claims 1 to 16, as a temperature sensor.

24.- Use of an electro-optical device according to any of claims 1 to 16, for acoustic applications.

25.- Use of an electro-optical device according to any of claims 1 to 16, as a gas sensor.

26.- Use of an electro-optical device according to any of claims 1 to 16, for the manufacture of an optical switching matrix.

27.- Use of an electro-optical device according to any one of claims 1 to 16, for projecting images.